

Remarks

In response to the Examiner's Office Action dated May 29, 2008, Applicant submits the following remarks.

Initially, Applicant would remind that the two independent claims herein are directed to unique processing methods for management of memory buffers in digital video decoding and in particular, digital video modes in which "frames of digital video are displayed in other than their original order" (see claim 1) or, more particularly, a "reverse order" (see claim 13).

Within the context of this "trick play" mode of operation, the claims describe a method of selecting decode and display buffers for decoding. Notably, as recited in claim 1, the decode buffer that will store decoded digital video is selected "without regard to a current playback mode or type of video frame being decoded." That is, the algorithm for selection of a buffer is independent of the type of video or type of frame. This is a key advantageous difference of the claimed invention from the cited prior art, in that the claimed invention may dynamically adapt to widely varying memory arrangements without alteration of the memory management methods used. As stated in the specification at page 104, line 14, "the host may dynamically reallocate memory to change the number of frame buffers on-the-fly. This may be done, for example, during playback mode transitions; e.g., more frame buffers may be made available in reverse playback modes than in other modes to permit faster processing. Furthermore,

the foregoing described operations [are] performed for both MPEG-1 input data, such as used on VCD, as well as MPEG-2 input data, such as is used on DVD. It will be appreciated that MPEG-1 data is often recorded at a lower resolution and accordingly requires less frame buffer space to store. Thus, the number of frame buffers can be larger for VCD playback than DVD playback.”

Claim 13 recites a method of managing memory that decodes frames in a “forward order” until frame buffers are “respectively storing first and second prior video frames preceding said current video frame in forward order”. Then the prior frames are displayed without re-decoding.

Claim 13 thus presents a method that advantageously displays all frames of an MPEG stream in their reverse order after decoding those frames in forward order, while also avoiding re-decoding of frames. Specifically, forward decoding is used to generate at least two frames preceding the current frame, which are then displayed in a reversed order. This is clearly advantageous over decoding methods that, for each frame to be displayed, must decode forward to that frame from first preceding intra-coded or “I” and predicted or “P” frames in the MPEG stream, thus requiring the re-decoding of multiple frames for each displayed frame.

Notably, the present claims also state that intra-coded (I) frames, predicted (P) frames and bidirectionally coded (B) frames are all decoded according to the stated methodology. Specifically claims 1 and 13 both state “the digital video data comprises frames of an intra-coded (I) type, a predicted (P) type and bi-directionally

coded (B) type, and frames of all three types are decoded, buffered and displayed in accordance with the method”.

The Examiner has applied the Comer patent, 6,201,927 in rejecting claims. Although Comer describes a reverse playback mode, as stated in Comer col. 2 line 66, col. 3, line 12, col. 3 line 54, and col. 10 line 53, the reverse playback operation described by Comer is a "three times speed" reverse playback, and it may be seen that in this operation only the "I" and "P" reference frames of an MPEG group of pictures are decoded. At col. 12, line 32, there begins a discussion of a "six times play speed" reverse playback mode in which fewer "I" and "P" frames, but still no "B" frames, are decoded.

Because Comer has no disclosure of a reverse or out of order playback method that decodes I, P and B frames, the Examiner has cited to Schultz, indicating that Schultz “discloses wherein the digital video data comprises frames of an intra-coded (I) type, a predicted (P) type and bi-directionally code (B) type, and frames of all three types are decoded, buffered and displayed in accordance with the method.”

The disclosure in Schultz to which the Examiner references, however, does not lead to a combination that meets the claim recitations. Initially, it should be noted that the embodiment depicted in Schultz Fig. 1B is, like Comer, a method in which reverse playback is accomplished by skipping over the B frames – as is apparent from Fig. 1B, the method involves decoding only I and P frames. However, in discussing Fig. 1B Schultz indicates (col. 2 line 13) that “[t]o smoothly portray scene

motion requires the decoding and display of I, P, and possibly B-frames". Decoding B-frames is further addressed at col. 10, lines 48-65, which state "[o]peration in reverse at play speed requires the reproduction of B-frames and in a further trick mode optimization reverse mode operation is advantageously simplified in terms of buffer memory requirements by reversing the order in which adjacent B pictures are decoded. This advantageous reversal of decoding order is achieved by setting or controlling the memory start pointers to enable decoding of specific pictures required by the trick mode. ... Memory size and control may be further optimized during trick play by advantageously enabling multiple decoding of pictures either immediately or as specifically required by the trick play algorithm. The provision of these advantageous features requires careful control of read/write functions and the synchronization therebetween."

Considering this disclosure in Schultz, combined with Comer, the Examiner cannot produce the claimed invention, for the following reasons:

Claim 1, and those claims that depend therefrom, recite a method in which the decode buffer that will store decoded digital video is selected "without regard to a current playback mode or type of video frame being decoded." That is, the algorithm for selection of a buffer is independent of the type of playback or type of frame. This is in direct opposition to the Schultz discussion quoted above, in which reverse play involves order reversals, controlling memory start pointers and, most on point, "careful control of read/write functions and the synchronization therebetween".

Schultz thus clearly teaches that special handling is to be applied for reverse play modes, specifically including manipulation of memory start pointers and read/write functions and synchronization. It cannot be said that Schultz discloses a method in which memory buffering is performed “without regard to a current playback mode or type of video frame being decoded”, as claimed. As Schultz is the only citation for disclosure of a method for decoding B-frames in a reverse order, the combination of Schultz and Comer falls short of suggesting the invention as claimed.

With regard to claim 13, there is a similar situation. Claim 13, as noted above, decodes frames in a “forward order” until frame buffers are “respectively storing first and second prior video frames preceding said current video frame in forward order”. In direct opposition, Schultz asserts that reverse play should proceed by “reversing the order in which adjacent B pictures are decoded.” Thus, rather than decoding in forward order, Schultz is suggesting the opposite, decoding in a reversed order. This disclosure is this completely inconsistent with what is recited by claim 13. Here again, as Schultz is the only citation for disclosure of a method for decoding B-frames in a reverse order, the combination of Schultz and Comer falls short of suggesting the invention as claimed

Applicant thus submits that the independent claims as presented distinguish the Comer reference, which is the only reference cited against those claims, and thus all claims are allowable.

Applicant is of the opinion that a one-month extension of time, which is

hereby requested, is due as a result of this Amendment. Payment of all charges due for this filing is made on the attached Electronic Fee Sheet. If any additional charges or credits are necessary to complete this communication, please apply them to Deposit Account No. 23-3000.

Respectfully submitted,

/ Thomas W. Humphrey /

Thomas W. Humphrey
Reg. No. 34,353

Wood, Herron & Evans, L.L.P.
2700 Carew Tower
441 Vine Street
Cincinnati, OH 45202-2917

Voice: (513) 241-2324
Facsimile: (513) 241-6234